

# CAT 2024 Expected Paper

## 90% paper pattern will be based on this!

“4 Days Score Improvement Plan”



## Babaji Ek IIM Call! Timetable!



### Verbal

Day	Question	CAT 2021	CAT 2022	CAT 2023	Total	Accuracy
Day 1	Argument	13	9	7	29	
	Why this happened	9	5	14	28	
Day 2	Similarity	4	8	5	17	
	Inference	9	11	5	25	
Day 3	Truth/Conclusion	4	10	7	20	
	Title Main Idea	6	2	7	15	
	Organization	3	3	3	9	
Day 4	Summary	9	9	6	24	
	Jumbled	9	9	6	24	
	Completion	-	6	6	12	
Odd Man Out		6	-	6	12	
Total		72	72	72	216	

No Speed Reading  
Understanding Editorials

Reading

Type of Ques

Accuracy

Argument  
Why this happened  
Inference  
Truth/Conclusion  
Similarity  
Title Main Idea  
Organization

Tracking Accuracy of each type of question

Arrangement

Schedule

Calculations

Tree

Double Trouble

Teeny Arrangement

Wide Arrangement

Caselets

### DILR

Day	G Strategy	CAT 2021	CAT 2022	CAT 2023	Total	My
Day 1	Numbers Arrangement	6	4	5	15	
Day 2	Scheduling & Routes	4	2	3	9	
Day 3	Calculations	1	3	1	5	
Day 4	Tree Arrangement	3	3	1	4	
	Double Trouble	1	2	2	3	
Total		12	12	12	36	

Breakup

"x" ki maro

Vedic Tables

Visual POE

### Quant

Day	G Strategy in CAT 2023	Slot 1	Slot 2	Slot 3	My
Day 1	Breakup	9	6	7	
Day 2	Vedic Table	2	4	2	
Day 3	Visual POE	3	3	3	
Day 4	X maro	2	2	3	
Total		16	15	15	

## Score vs Percentile vs Cutoffs

Marks in CAT Exam

Category	VARC	DILR	QA	Baby	New	Main	ABC
<b>GEM</b>	18	12	10	55	65	76	90
<b>General</b>	18	12	10	50	60	70	76
<b>EWS</b>	18	12	10	33	39	50	65
<b>NC-OBC</b>	14	9	7	33	39	50	65
<b>SC</b>	9	6	4	27	33	39	42
<b>ST</b>	9	6	4	27	33	39	42
<b>PwD</b>	9	6	4	27	33	39	42

Percentile in CAT Exam

Category	QA	DILR	VARC	Baby	New	Main	ABC
<b>GEM</b>	80%	80%	80%	95%	97%	99%	99.7%
<b>General</b>	80%	80%	80%	93%	96%	98%	99%
<b>EWS</b>	80%	80%	80%	80%	85%	92%	97%
<b>NC-OBC</b>	70%	70%	70%	80%	85%	92%	97%
<b>SC</b>	55%	55%	55%	70%	80%	85%	92%
<b>ST</b>	55%	55%	55%	70%	80%	85%	92%
<b>PwD</b>	55%	55%	55%	70%	80%	85%	92%

## Verbal Section

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Nature has all along yielded her flesh to humans. First, we took nature's materials as food, fibers, and shelter. Then we learned to extract raw materials from her biosphere to create our own new synthetic materials. Now Bios is yielding us her mind—we are taking her logic. Clockwork logic—the logic of the machines—will only build simple contraptions. Truly complex systems such as a cell, a meadow, an economy, or a brain (natural or artificial) require a rigorous nontechnological logic. We now see that no logic except bio-logic can assemble a thinking device, or even a workable system of any magnitude.

It is an astounding discovery that one can extract the logic of Bios out of biology and have something useful. Although many philosophers in the past have suspected one could abstract the laws of life and apply them elsewhere, it wasn't until the complexity of computers and human-made systems became as complicated as living things, that it was possible to prove this. It's eerie how much of life can be transferred. So far, some of the traits of the living that have successfully been transported to mechanical systems are: self-replication, self-governance, limited self-repair, mild evolution, and partial learning.

We have reason to believe yet more can be synthesized and made into something new. Yet at the same time that the logic of Bios is being imported into machines, the logic of Technos is being imported into life. The root of bioengineering is the desire to control the organic long enough to improve it. Domesticated plants and animals are examples of technos-logic applied to life. The wild aromatic root of the Queen Anne's lace weed has been fine-tuned over generations by selective herb gatherers until it has evolved into a sweet carrot of the garden; the udders of wild bovines have been selectively enlarged in a "unnatural" way to satisfy humans rather than calves. Milk cows and carrots, therefore, are human inventions as much as steam engines and gunpowder are. But milk cows and carrots are more indicative of the kind of inventions humans will make in the future: products that are grown rather than manufactured.

Genetic engineering is precisely what cattle breeders do when they select better strains of Holsteins, only bioengineers employ more precise and powerful control. While carrot and milk cow breeders had to rely on diffuse organic evolution, modern genetic engineers can use directed artificial evolution—purposeful design—which greatly accelerates improvements. The overlap of the mechanical and the lifelike increases year by year. Part of this bionic convergence is a matter of words. The meanings of "mechanical" and "life" are both stretching until all complicated things can be perceived as machines, and all self-sustaining machines can be perceived as alive. Yet beyond semantics, two concrete trends are happening: (1) Human-made things are behaving more lifelike, and (2) Life is becoming more engineered. The apparent veil between the organic and the manufactured has crumpled to reveal that the two really are, and have always been, of one being.

1. None of the following statements is implied by the arguments of the passage, EXCEPT:
  - 1) the biological realm is as complex as the mechanical one; which is why the logic of Bios is being imported into machines.
  - 2) historically, philosophers have known that the laws of life can be abstracted and applied elsewhere.
  - 3) genetic engineers and bioengineers are the same insofar as they both seek to force evolution in an artificial way.
  - 4) purposeful design represents the pinnacle of scientific expertise in the service of human betterment and civilisational progress.
  
2. The author claims that, "The apparent veil between the organic and the manufactured has crumpled to reveal that the two really are, and have always been, of one being." Which one of the following statements best expresses the point being made by the author here?
  - 1) Organic reality has crumpled under the veil of manufacturing, rendering the apparent and the real as the same being.
  - 2) Scientific advances are making it increasingly difficult to distinguish between organic reality and manufactured reality.
  - 3) Apparent reality and organic reality are distinguished by the fact that the former is manufactured.
  - 4) The crumpling of the organic veil between apparent and manufactured reality reveals them to have the same being.
  
3. Which one of the following sets of words/phrases best serves as keywords to the passage?
  - 1) Nature; Computers; Carrots; Milk cows; Genetic engineering
  - 2) Nature; Bios; Technos; Self-repair; Holsteins
  - 3) Complex systems; Bio-logic; Bioengineering; Technos-logic; Convergence
  - 4) Complex systems; Carrots; Milk cows; Convergence; Technos-logic
  
4. The author claims that, "Part of this bionic convergence is a matter of words". Which one of the following statements best expresses the point being made by the author?
  - 1) "Mechanical" and "life" are words from different logical systems and are, therefore, fundamentally incompatible in meaning.
  - 2) "Mechanical" and "life" were earlier seen as opposite in meaning, but the difference between the two is increasingly blurred.
  - 3) A bionic convergence indicates the meeting ground of genetic engineering and artificial intelligence.
  - 4) "Bios" and "Technos" are both convergent forms of logic, but they generate meanings about the world that are mutually exclusive.

The passage below is accompanied by a set of questions. Choose the best answer to each question.

In a low-carbon world, renewable energy technologies are hot business. For investors looking to redirect funds, wind turbines and solar panels, among other technologies, seem a straightforward choice. But renewables need to be further scrutinized before being championed as forging a path toward a low-carbon future. Both the direct and indirect impacts of renewable energy must be examined to ensure that a climate-smart future does not intensify social and environmental harm. As renewable energy production requires land, water, and labor, among other inputs, it imposes costs on people and the environment. Hydropower projects, for instance, have led to community dispossession and exclusion . . . Renewable energy supply chains are also intertwined with mining, and their technologies contribute to growing levels of electronic waste . . . Furthermore, although renewable energy can be produced and distributed through small-scale, local systems, such an approach might not generate the high returns on investment needed to attract capital.

Although an emerging sector, renewables are enmeshed in long-standing resource extraction through their dependence on minerals and metals . . . Scholars document the negative consequences of mining . . . even for mining operations that commit to socially responsible practices[:] “many of the world’s largest reservoirs of minerals like cobalt, copper, lithium, [and] rare earth minerals”—the ones needed for renewable technologies—“are found in fragile states and under communities of marginalized peoples in Africa, Asia, and Latin America.” Since the demand for metals and minerals will increase substantially in a renewablepowered future . . . this intensification could exacerbate the existing consequences of extractive activities.

Among the connections between climate change and waste, O’Neill . . . highlights that “devices developed to reduce our carbon footprint, such as lithium batteries for hybrid and electric cars or solar panels [,] become potentially dangerous electronic waste at the end of their productive life.” The disposal of toxic waste has long perpetuated social injustice through the flows of waste to the Global South and to marginalized communities in the Global North . . .

While renewable energy is a more recent addition to financial portfolios, investments in the sector must be considered in light of our understanding of capital accumulation. As agricultural finance reveals, the concentration of control of corporate activity facilitates profit generation. For some climate activists, the promise of renewables rests on their ability not only to reduce emissions but also to provide distributed, democratized access to energy . . . But Burke and Stephens . . . caution that “renewable energy systems offer a possibility but not a certainty for more democratic energy futures.” Small-scale, distributed forms of energy are only highly profitable to institutional investors if control is consolidated somewhere in the financial chain. Renewable energy can be produced at the household or neighborhood level. However, such small-scale, localized production is unlikely to generate high returns for investors. For financial growth to be sustained and expanded by the renewable sector, production and trade in renewable energy technologies will need to be highly concentrated, and large asset management firms will likely drive those developments.

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5. Which one of the following statements best captures the main argument of the last paragraph of the passage?
- 1) Renewable energy produced at the household or neighbourhood level is more efficient than massproduced forms of energy.
  - 2) The development of the renewable energy sector is a double-edged sword.
  - 3) Renewable energy systems are not democratic unless they are corporate-controlled.
  - 4) Most forms of renewable energy are not profitable investments for institutional investors.
6. All of the following statements, if true, could be seen as supporting the arguments in the passage, EXCEPT:
- 1) Marginalised people in Africa, Asia and Latin America have often been the main sufferers of corporate mineral extraction projects.
  - 2) The example of agricultural finance helps us to see how to concentrate corporate activity in the renewable energy sector.
  - 3) The possible negative impacts of renewable energy need to be studied before it can be offered as a financial investment opportunity.
  - 4) One reason for the perpetuation of social injustice lies in the problem of the disposal of toxic waste.
7. Which one of the following statements, if false, could be seen as best supporting the arguments in the passage?
- 1) Renewable energy systems are as expensive as non-renewable energy systems.
  - 2) Renewable energy systems have little or no environmental impact.
  - 3) Renewable energy systems are not as profitable as non-renewable energy systems.
  - 4) The production and distribution of renewable energy through small-scale, local systems is not economically sustainable.
8. Which one of the following statements, if true, could be an accurate inference from the first paragraph of the passage?
- 1) The author has reservations about the consequences of non-renewable energy systems.
  - 2) The author's only reservation is about the profitability of renewable energy systems.
  - 3) The author has reservations about the consequences of renewable energy systems.
  - 4) The author does not think renewable energy systems can be as efficient as non-renewable energy systems.

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The passage below is accompanied by a set of questions. Choose the best answer to each question.

Back in the early 2000s, an awesome thing happened in the New X-Men comics. Our mutant heroes had been battling giant robots called Sentinels for years, but suddenly these mechanical overlords spawned a new threat: Nano-Sentinels! Not content to rule Earth with their metal fists, these tiny robots invaded our bodies at the microscopic level. Infected humans were slowly converted into machines, cell by cell.

Now, a new wave of extremely odd robots is making at least part of the Nano-Sentinels story come true. Using exotic fabrication materials like squishy hydrogels and elastic polymers, researchers are making autonomous devices that are often tiny and that could turn out to be more powerful than an army of Terminators. Some are 1-centimetre blobs that can skate over water. Others are flat sheets that can roll themselves into tubes, or matchstick-sized plastic coils that act as powerful muscles. No, they won't be invading our bodies and turning us into Sentinels – which I personally find a little disappointing – but some of them could one day swim through our bloodstream to heal us. They could also clean up pollutants in water or fold themselves into different kinds of vehicles for us to drive. . . .

Unlike a traditional robot, which is made of mechanical parts, these new kinds of robots are made from molecular parts. The principle is the same: both are devices that can move around and do things independently. But a robot made from smart materials might be nothing more than a pink drop of hydrogel. Instead of gears and wires, it's assembled from two kinds of molecules – some that love water and some that avoid it – which interact to allow the bot to skate on top of a pond.

Sometimes these materials are used to enhance more conventional robots. One team of researchers, for example, has developed a different kind of hydrogel that becomes sticky when exposed to a low-voltage zap of electricity and then stops being sticky when the electricity is switched off. This putty-like gel can be pasted right onto the feet or wheels of a robot. When the robot wants to climb a sheer wall or scoot across the ceiling, it can activate its sticky feet with a few volts. Once it is back on a flat surface again, the robot turns off the adhesive like a light switch.

Robots that are wholly or partly made of gloop aren't the future that I was promised in science fiction. But it's definitely the future I want. I'm especially keen on the nanometre-scale "soft robots" that could one day swim through our bodies. Metin Sitti, a director at the Max Planck Institute for Intelligent Systems in Germany, worked with colleagues to prototype these tiny, synthetic beasts using various stretchy materials, such as simple rubber, and seeding them with magnetic microparticles. They are assembled into a finished shape by applying magnetic fields. The results look like flowers or geometric shapes made from Tinkertoy ball and stick modelling kits. They're guided through tubes of fluid using magnets, and can even stop and cling to the sides of a tube.

9. Which one of the following statements, if true, would be the most direct extension of the arguments in the passage?
- 1) X-Men may be created by injecting people with mutant nano-gels that will respond to the brain's magnetic field.
  - 2) In the future, robots will be used to search and destroy diseases even in the deepest recesses of the human body.
  - 3) Sentinel robots will be used in warfare to cause large-scale destructive mutations amongst civilians.
  - 4) 1-centimetre blobs of gel that have nano-robots in them will be used to send messages.
10. Which one of the following statements best summarises the central point of the passage?
- 1) Once the stuff of science fiction, nano-robots now feature in cutting-edge scientific research.
  - 2) Robots will use nano-robots on their feet and wheels to climb walls or move on ceilings.
  - 3) The field of robotics is likely to be feature more and more in comics like the New X-Men.
  - 4) Nano-robots made from molecules that react to water have become increasingly useful.
11. Which one of the following statements best captures the sense of the first paragraph?
- 1) Tiny sentinels called X-Men infected people, turning them into mutant robot overlords.
  - 2) None of the options listed here.
  - 3) The X-Men were mutant heroes who now had to battle tiny robots called Nano-Sentinels.
  - 4) People who were infected by Nano-Sentinel robots became mutants who were called X-Men.
12. Which one of the following scenarios, if false, could be seen as supporting the passage?
- 1) There are two kinds of molecules used to make some nano-robots: one that reacts positively to water and the other negatively.
  - 2) Some hydrogels turn sticky when an electric current is passed through them; this potentially has very useful applications.
  - 3) Nano-Sentinel-like robots are likely to be used to inject people to convert them into robots, cell by cell.
  - 4) Robots made from smart materials are likely to become part of our everyday lives in the future.

# CAT 2024 Expected Paper

The Orientals have two different concepts of a copy. Fangzhipin . . . are imitations where the difference from the original is obvious. These are small models or copies that can be purchased in a museum shop, for example. The second concept for a copy is fuzhipin . . . They are exact reproductions of the original, which, for the Oriental, are of equal value to the original. It has absolutely no negative connotations. The discrepancy with regard to the understanding of what a copy is has often led to misunderstandings and arguments between China and Western museums. The Oriental often send copies abroad instead of originals, in the firm belief that they are not essentially different from the originals. The rejection that then comes from the Western museums is perceived by the Oriental as an insult. . . .

The Far Eastern notion of identity is also very confusing to the Western observer. The Ise Grand Shrine [in Japan] is 1,300 years old for the millions of Japanese people who go there on pilgrimage every year. But in reality this temple complex is completely rebuilt from scratch every 20 years. . . .

The cathedral of Freiburg Minster in southwest Germany is covered in scaffolding almost all year round. The sandstone from which it is built is a very soft, porous material that does not withstand natural erosion by rain and wind. After a while, it crumbles. As a result, the cathedral is continually being examined for damage, and eroded stones are replaced. And in the cathedral's dedicated workshop, copies of the damaged sandstone figures are constantly being produced. Of course, attempts are made to preserve the stones from the Middle Ages for as long as possible. But at some point they, too, are removed and replaced with new stones. Fundamentally, this is the same operation as with the Japanese shrine, except in this case the production of a replica takes place very slowly and over long periods of time. . . . In the field of art as well, the idea of an unassailable original developed historically in the Western world. Back in the 17th century [in the West], excavated artworks from antiquity were treated quite differently from today. They were not restored in a way that was faithful to the original. Instead, there was massive intervention in these works, changing their appearance. . . .

It is probably this intellectual position that explains why Asians have far fewer scruples about cloning than Europeans. The South Korean cloning researcher Hwang Woo-suk, who attracted worldwide attention with his cloning experiments in 2004, is a Buddhist. He found a great deal of support and followers among Buddhists, while Christians called for a ban on human cloning. . . . Hwang legitimised his cloning experiments with his religious affiliation: 'I am Buddhist, and I have no philosophical problem with cloning. And as you know, the basis of Buddhism is that life is recycled through reincarnation. In some ways, I think, therapeutic cloning restarts the circle of life.'

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The Far Eastern notion of identity is also very confusing to the Western observer. The Ise Grand Shrine [in Japan] is 1,300 years old for the millions of Japanese people who go there on pilgrimage every year. But in reality this temple complex is completely rebuilt from scratch every 20 years. . . .

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13. Which one of the following statements does not correctly express the similarity between the Ise Grand Shrine and the cathedral of Freiburg Minster?

- 1) Both were built as places of worship.
- 2) Both can be regarded as very old structures.
- 3) Both are continually undergoing restoration.
- 4) Both will one day be completely rebuilt.

14. The value that the modern West assigns to "an unassailable original" has resulted in all of the following EXCEPT:

- 1) it allows regular employment for certain craftsmen.
- 2) it discourages them from making interventions in ancient art.
- 3) it discourages them from carrying out human cloning.
- 4) it discourages them from simultaneous displays of multiple copies of a painting.

15. Which one of the following scenarios is unlikely to follow from the arguments in the passage?

- 1) A 20th century Japanese Buddhist monk would value a reconstructed shrine as the original.
- 2) A 17th century British painter would have no problem adding personal touches when restoring an ancient Roman painting.
- 3) A 17th century French artist who adhered to a Christian worldview would need to be completely true to the original intent of a painting when restoring it.
- 4) A 21st century Christian scientist is likely to oppose cloning because of his philosophical orientation.

16. Based on the passage, which one of the following copies would a Oriental museum be unlikely to consider as having less value than the original?

- 1) Pablo Picasso's painting of Vincent van Gogh's original painting, identical in every respect.
- 2) Pablo Picasso's painting of Vincent van Gogh's original painting, bearing Picasso's signature.
- 3) Pablo Picasso's miniaturised, but otherwise faithful and accurate painting of Vincent van Gogh's original painting.
- 4) Pablo Picasso's photograph of Vincent van Gogh's original painting, printed to exactly the same scale.

17. The four sentences (labelled 1, 2, 3 and 4) below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer:

- (1) Fish skin collagen has excellent thermo-stability and tensile strength making it ideal for use as bandage that adheres to the skin and adjusts to body movements.
- (2) Collagen, one of the main structural proteins in connective tissues in the human body, is well known for promoting skin regeneration.
- (3) Fish skin swims in here as diseases and bacteria that affect fish are different from most human pathogens.
- (4) The risk of introducing disease agents into other species through the use of pig and cow collagen proteins for wound healing has inhibited its broader applications in the medical field. \_\_\_\_\_ TITA

18. The four sentences (labelled 1, 2, 3 and 4) below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer:

- (1) The creative element in product design has become of paramount importance as it is one of the few ways a firm or industry can sustain a competitive advantage over its rivals.

- (2) In fact, the creative element in the value of world industry would be larger still, if we added the contribution of the creative element in other industries, such as the design of tech accessories.
- (3) The creative industry is receiving a lot of attention today as its growth rate is faster than that of the world economy as a whole.
- (4) It is for this reason that today's trade issues are increasingly involving intellectual property, as Western countries have an interest in protecting their revenues along with freeing trade in nontangibles.

19. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Easing the anxiety and pressure of having a “big day” is part of the appeal for many couples who marry in secret.

Paragraph: Wedding season is upon us and - after two years of Covid chaos that saw nuptials scaled back- you may think the temptation would be to go all out. \_\_\_(1)\_\_. But instead of expanding the guest list, many couples are opting to have entirely secret ceremonies. With Covid case numbers remaining high and the cost of living crisis meaning that many couples are feeling the pinch, it's no wonder that some are less than eager to send out invites. \_\_\_(2)\_\_. Plus, it can't hurt that in celebrity circles getting married in secret is all the rage. \_\_\_(3)\_\_. “I would definitely say that secret weddings are becoming more common,” says Landis Bejar, the founder of a therapy practice, which specialises in helping brides and grooms manage wedding stress. “People are looking for ways to get out of the spotlight and avoid the pomp and circumstance of weddings. \_\_\_(4)\_\_. They just want to get to the part where they are married.”

- 1) Option 1    2) Option 2    3) Option 3    4) Option 4

20. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Having made citizens more and less knowledgeable than their predecessors, the Internet has proved to be both a blessing and a curse.

Paragraph: Never before has a population, nearly all of whom has enjoyed at a least a secondary school education, been exposed to so much information, whether in newspapers and magazines or through YouTube, Google, and Facebook. \_\_\_(1)\_\_. Yet it is not clear that people today are more knowledgeable than their barely literate predecessors. Contemporary advances in technology offered more serious and inquisitive students access to realms of knowledge previously unimaginable and unavailable. \_\_\_(2)\_\_. But such readily available knowledge leads many more students away from serious study, the reading of actual texts, and toward an inability to write effectively and grammatically. \_\_\_(3)\_\_. It has let people choose sources that reinforce their opinions rather than encouraging them to question inherited beliefs. \_\_\_(4)\_\_.

- 1) Option 1    2) Option 2    3) Option 3    4) Option 4

21. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

The human mind is wired to see patterns. Not only does the brain process information as it comes in, it also stores insights from all our past experiences. Every interaction, happy or sad, is catalogued in our memory. Intuition draws from that deep memory well to inform our decisions going forward. In other words, intuitive decisions are based on data, and not contrary to data as many would like to assume. When we subconsciously spot patterns, the body starts firing neurochemicals in both the brain and gut. These “somatic markers” are what give us that instant sense that something is right ... or that it's off. Not only are these automatic processes faster than rational thought, but our intuition draws from decades of diverse qualitative experience (sights, sounds, interactions, etc.) – a wholly human feature that big data alone could never accomplish.

- 1) Intuitions are neuro-chemical firings based on pattern recognition and draw upon a rich and vast database of experiences.
- 2) Intuition is infinitely richer than big data which is based on rational thought and accomplishes more than what big data can.

- 3) Intuitions are automatic processes and are therefore faster than rational thought, and so decisions based on them are better.
- 4) Intuition draws from deep memory, and may not be related to data, but to decades of diverse qualitative experience.

22. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Brazil's growth rate has been low, yet most Brazilians say their financial situation has improved, and they expect it to get even better. This is because most incomes are rising fast, with higher minimum wages and very low unemployment. The result is falling inequality and a growing middle class — the result of economic stabilization, improved social security and universal primary education. But despite recent improvements the Brazilian economy is still painfully unequal, with poor Brazilians paying the biggest share of their income in taxes and getting the least back in government services.

- 1) With rising incomes and falling unemployment, most Brazilians are being misled into thinking that their economy is doing well.
- 2) Most Brazilians feel they have benefitted from recent economic events, but the poor continue to be dealt unfairly by the state.
- 3) Economic reforms have benefitted many Brazilians, but they are unaware of the impending problems from rising inequalities in their society.
- 4) Good economic indicators have masked the unfair taxation of the poor that is likely to destabilise the Brazilian economy in the next few years.

23. Five jumbled up sentences, related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd one out and key in the number of the sentence as your answer:

1. They often include a foundation course on navigating capitalism with Chinese characteristics and have replaced typical cases from US corporates with a focus on how Western theories apply to China's buzzing local firms.
2. The best Chinese business schools look like their Western rivals but are now growing distinct in terms of what they teach and the career boost they offer.
3. Western schools have enhanced their offerings with double degrees, popular with domestic and overseas students alike—and boosted the prestige of their Chinese partners.
4. For students, a big draw is the chance to rub shoulders with captains of China's private sector.
5. Their business courses now largely cater to the growing demand from China Inc which has become more global, richer and ready to recruit from this sinocentric student body.

24. Five jumbled up sentences, related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd one out and key in the number of the sentence as your answer:

1. A typical example is Wikipedia, where the overwhelming majority of contributors are male and so the available content is skewed to reflect their interests.
2. Without diversity of thought and representation, society is left with a distorted picture of future options, which are likely to result in augmenting existing inequalities.
3. Gross gender inequality in the technology sector is problematic, not only for the industry-wide marginalisation of women, but because technology designs embody the values of their makers.
4. While redressing unequal representation in the workplace is a step in the right direction, broader social change is needed to address the structural inequalities embedded within the current organisation of work and employment.
5. If technology merely reflects the perspectives of the male stereotype, then new technologies are unlikely to accommodate the diverse social contexts within which they operate.

## Answers

### 1. G Strategy: Argument

Option 3 is correct, As the author suggests that genetic engineers and bioengineers are similar in that they both aim to influence evolution artificially. This is supported by the penultimate paragraph, where the author highlights this similarity.

Explanation of Incorrect Options:

- 1) the biological realm is as complex as the mechanical one; which is why the logic of Bios is being imported into machines.
- 2) historically, philosophers have known that the laws of life can be abstracted and applied elsewhere.
- 4) purposeful design represents the pinnacle of scientific expertise in the service of human betterment and civilisational progress.

## 2. G Strategy: Claim Truth Conclusion

Option 2 is correct, as it conveys the same meaning as the quoted sentence. This is also supported by the last sentence of the passage, which aligns with the idea expressed in Option 2.

Incorrect answers:

- 1) Organic reality has crumpled under the veil of manufacturing, rendering the apparent and the real as the same being.
- 3) Apparent reality and organic reality are distinguished by the fact that the former is manufactured.
- 4) The crumpling of the organic veil between apparent and manufactured reality reveals them to have the same being.

3. Option (3) conveys the correct sequence of ideas given in the passage. The other options are incorrect in the light of the passage.

## 4. G Strategy: Claim Truth Conclusion

Option 2, The last paragraph of the passage highlights how the distinction between the organic and the manufactured has been effectively erased. This aligns with the quoted sentence, while the other options lack support based on the passage content and cannot be substantiated. The other options cannot be substantiated in the light of the given quoted sentence.

- 1) "Mechanical" and "life" are words from different logical systems and are, therefore, fundamentally incompatible in meaning.
- 3) A bionic convergence indicates the meeting ground of genetic engineering and artificial intelligence.
- 4) "Bios" and "Technos" are both convergent forms of logic, but they generate meanings about the world that are mutually exclusive.

## 5. G Strategy: Argument

Option 2 is correct, as the passage explores both the benefits and drawbacks of renewable energy. This is evident from the line: “Both the direct and indirect impacts of renewable energy must be examined to ensure that a climate-smart future does not intensify social and environmental harm.”

Incorrect Options:

- Option 1 is incorrect because, while the passage mentions that small-scale renewable energy production may not yield high investor returns, it does not claim that this form is more efficient than mass-produced energy.
- Option 3 is incorrect, as it contradicts the passage's discussion on democratic energy distribution. The passage states, “renewable energy systems offer a possibility but not a certainty for more democratic energy futures.”
- Option 4 is also incorrect; the passage indicates that renewable technology is indeed profitable but suggests that small-scale production may not yield high returns on investment.

## 6. G Strategy: Argument

Option 3 is the correct answer because, while the passage highlights the need to consider the social and environmental impacts of renewable energy, it does not state that these potential negative effects must be evaluated before renewable energy can be offered as a financial investment opportunity.

Explanation of Incorrect Options:

- Option 1 is referenced in the second paragraph of the passage.
- Option 2 is covered in the first and second sentences of the fourth paragraph, where it states, “While renewable energy is a more recent addition to financial portfolios, investments in the sector must be considered in light of our understanding of capital accumulation. As agricultural finance reveals, the concentration of control of corporate activity facilitates profit generation.”
- Option 4 appears in the final sentence of the passage, which mentions, “The disposal of toxic waste has long perpetuated social injustice through the flows of waste to the Global South and to marginalized communities in the Global North...”

## 7. G Strategy: Argument

Option 2 is correct, as it is false according to the passage. The passage states, “As renewable energy production requires land, water, and labor, among other inputs, it imposes costs on people and the environment. Hydropower projects, for instance, have led to community dispossession and exclusion...”

Explanation of Other Options:

- Option 1 is correct, as renewable energy investments require substantial capital to achieve high returns.
- Option 3 is also correct, as non-renewable energy systems are described as more profitable.
- Option 4 is accurate as well; the passage notes that small-scale, localized renewable energy production “is unlikely to generate high returns for investors.”

## 8. G Strategy: Inference

Option 3 is the correct answer, as the author's main concern is whether renewable energy systems can function without causing environmental harm.

Explanation of Incorrect Options:

- Option 1 is incorrect because the author does not discuss non-renewable energy in the first paragraph of the passage.
- Option 2 is also incorrect, as profitability is not the author's only reservation; the author is primarily concerned with the potential environmental impact of renewable energy.
- Option 4 cannot be inferred from the passage.

## 9. G Strategy: Argument

Answer 2, Referring to statements like, “some of them could one day swim through our bloodstream to heal us” and “But it’s definitely the future I want. I’m especially keen on the nanometre-scale ‘soft robots’ that could one day swim through our bodies,” the author clearly supports the potential positive impact of these nanorobots. Option 1 is a far-fetched assumption that does not align with the author’s argument in the passage. Option 3 is incorrect, as it contradicts the author’s perspective. Option 4 is also based on an assumption that is too speculative.

## 10. G Strategy: Summary

Answer 1, The passage opens with an example from *X-Men* illustrating the use of nanorobots in the comics. After this introduction, it shifts to discussing how nanorobotic technology is becoming significant in the robotics industry and research, making option 1 the correct choice. Option 2 is not factually incorrect, as the passage does mention it, but it fails to capture the passage’s overall focus. Option 3 is incorrect because the author does not imply that the field of robotics should feature more prominently in *X-Men*. Option 4 is also incorrect, as it only addresses part of the passage and does not provide a complete summary.

## 11. G Strategy: Main Idea

Answer 3, The entire 1st paragraph showcase the rise of nano-sentinels in *X-Men* comics, which along with the sentinels but unlike them, invade our bodies at the microscopic level. So, the *X-Men* has to now fight both categories of villains. 3 captures the correct essence of the paragraph. Option 1 is incorrect because sentinels are not *X-Men*. Option 2 is incorrect because 3 is the correct answer. Option 4 is factually incorrect.

## 12. G Strategy: Argument

Answer 3, Refer to, “No, they won’t be invading our bodies and turning us into Sentinels – which I personally find a little disappointing – but some of them could one day swim through our bloodstream to heal us.” This makes option 3 the correct answer. Other options can be rendered incorrect. Although they are false but they are not supporting the passage.

## 13. G Strategy: Similarity

Answer 3. The Ise Grand Shrine and the Freiburg Minster Cathedral share a similarity in preservation practices, but with different approaches. The Japanese shrine is entirely rebuilt every 20 years, while the German cathedral undergoes continual renovation rather than complete reconstruction.

## 14. Answer 3. The value that the modern West assigns to “an unassailable original” has resulted in all of the following EXCEPT

- 1) it allows regular employment for certain craftsmen. Can be Inferred.
- 2) it discourages them from making interventions in ancient art. Can be Inferred.
- 3) it discourages them from carrying out human cloning. - cloning is not in the context of the unassailable original’. So correct answer.
- 4) it discourages them from simultaneous displays of multiple copies of a painting. Can be Inferred.

## 15. Answer 3. As the passage states: “Back in the 17th century [in the West], excavated artworks from antiquity were treated quite differently from today. They were not restored in a way that was faithful to the original. Instead, there was massive intervention in these works, changing their appearance. . .” The reference to religion comes in the context of cloning.

## 16. Answer 1. Refer the following lines from the first paragraph: “The second concept for a copy is fuzhipin ... They are exact reproductions of the original, which, for the Chinese, are of equal value to the original. It has absolutely no negative connotations.” The other options are examples of Fangzhipin and these are likely to have less value than the original.

## 17. Ck G Strategy: Ideal Start

Sentence 2 serves as the introductory sentence, setting up the topic of collagen. Sentence 43 follows logically, presenting the issue (the risk) and hinting at a possible solution (fish skin collagen). Sentence 1 effectively concludes the paragraph by highlighting the benefits of collagen derived from fish skin.

## 18. Ck G Strategy: Solve using pairing strategy

Sentences 3 and 2 are related pair related to the creative industry, The phrase "in fact" suggests that sentence 2 should logically follow sentence 3. Likewise, sentences 1 and 4 form a pair, as sentence 4 expands on the product design concept introduced in sentence 1.

## 19. Solution G Strategy: logical Alignment

In Blank 2, the situation suggests that couples may hesitate to send out invitations. Thus, option (2) is the best choice, as it aligns well with the theme of the blank.

## 20. Solution G Strategy: logical Alignment

The sentence before Blank 4 addresses the role of the internet. Thematically, this sentence aligns best in Blank 4, as it highlights both the advantages and disadvantages of the internet.

## 21. G Strategy: Understanding Main Idea

Intuitions arise from neurochemicals that create somatic markers, which our brain and gut recognize due to past experiences. Only option 1 accurately captures this idea, making it the correct summary. Option 2 is partially correct, while option 3 is incorrect, as it implies that decisions based on intuition are superior—an idea not present in the passage. Option 4 is also an incomplete summary.

## 22. G Strategy: Understanding Main Idea

Option 1 is incorrect due to the phrase "most Brazilians are being misled into," as there's no indication in the passage that Brazilians are being misled to believe the economy is strong. Option 3 is factually inaccurate, as shown in the line, "The result is falling inequality and a growing middle class..." Option 4 makes an assumption that goes beyond what can be inferred from the passage. Option 2 is the correct choice as it accurately reflects the passage's focus on Brazil's improving financial conditions, while also noting that the treatment of the poor remains "still painfully unequal."

## 23. G Strategy: Out of Context

Option 3 talks about the western schools in particular whereas the other 4 statements talk about the Chinese business schools in particular and the curses they offer and how the students are benefitting from that. Hence 3 is the odd one out.

## 24. G Strategy: Pairing

2 and 3 are are pair, so give the context of the passage. All sentences, except for sentence 4, can be arranged to form a coherent paragraph discussing gender inequality in the workplace and its significant impact on social contexts. Sentence 4, however, focuses on "the structural inequalities embedded within the current organization of work and employment," making it the outlier.

## DILR Section

Ministers holding Portfolios at Parliament can belong to one of four departments – Finance and Accounting (F&A), Marketing and Strategy (M&S), Operations and Quants (O&Q) and Behaviour and Human Resources (B&H). The numbers of MPs in F&A, M&S, O&Q and B&H departments are 9, 7, 5 and 3 respectively.

Prof. Pakrasi, Prof. Qureshi, Prof. Ramaswamy and Prof. Samuel are four members of the Parliament who were candidates for the post of the Dean of the Parliament. Only one of the candidates was from O&Q.

Every faculty member, including the four candidates, voted for the post. In each department, all the members who were not candidates voted for the same candidate. The rules for the election are listed below.

1. There cannot be more than two candidates from a single department.
2. A candidate cannot vote for himself/herself.
3. Faculty members cannot vote for a candidate from their own department.

After the election, it was observed that Prof. Pakrasi received 3 votes, Prof. Qureshi received 14 votes, Prof. Ramaswamy received 6 votes and Prof. Samuel received 1 vote. Prof. Pakrasi voted for Prof. Ramaswamy, Prof. Qureshi for Prof. Samuel, Prof. Ramaswamy for Prof. Qureshi and Prof. Samuel for Prof. Pakrasi.

1. Which two candidates can belong to the same department?

- 1) Prof. Pakrasi and Prof. Samuel
- 2) Prof. Pakrasi and Prof. Qureshi
- 3) Prof. Qureshi and Prof. Ramaswamy
- 4) Prof. Ramaswamy and Prof. Samuel

2. Which of the following can be the number of votes that Prof. Qureshi received from a single department?

- 1) 7
- 2) 9
- 3) 8
- 4) 6

3. If Prof. Samuel belongs to B&H, which of the following statements is/are true?

Statement A: Prof. Pakrasi belongs to M&S.

Statement B: Prof. Ramaswamy belongs to O&Q.

- 1) Neither statement A nor statement B
- 2) Both statements A and B
- 3) Only statement A
- 4) Only statement B

4. What best can be concluded about the candidate from O & Q?

- 1) It was either Prof. Pakrasi or Prof. Qureshi.
- 2) It was either Prof. Ramaswamy or Prof. Samuel.
- 3) It was Prof. Samuel.
- 4) It was Prof. Ramaswamy.

5. Which of the following statements is/are true?

Statement A: Non-candidates from M&S voted for Prof. Qureshi.

Statement B: Non-candidates from F&A voted for Prof. Qureshi.

- 1) Only statement A
- 2) Neither statement A nor statement B
- 3) Both statements A and B
- 4) Only statement B

# CAT 2024 Expected Paper

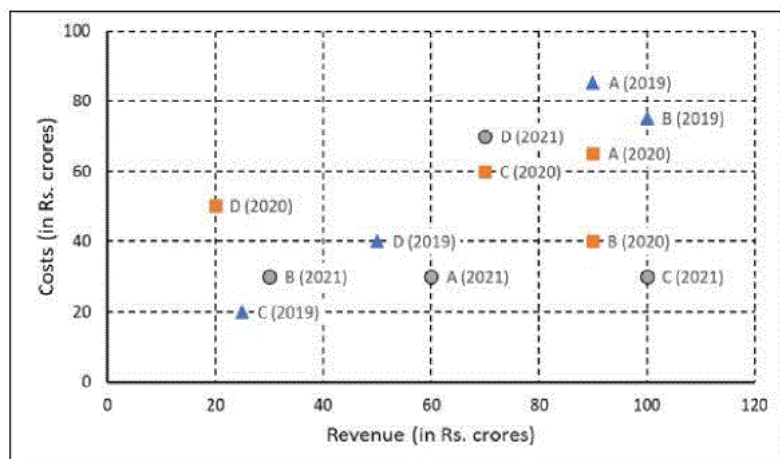
A speciality supermarket sells 320 products. Each of these products was either a cosmetic product or a nutrition product. Each of these products was also either a foreign product or a domestic product. Each of these products had at least one of the two approvals – FDA or EU.

The following facts are also known:

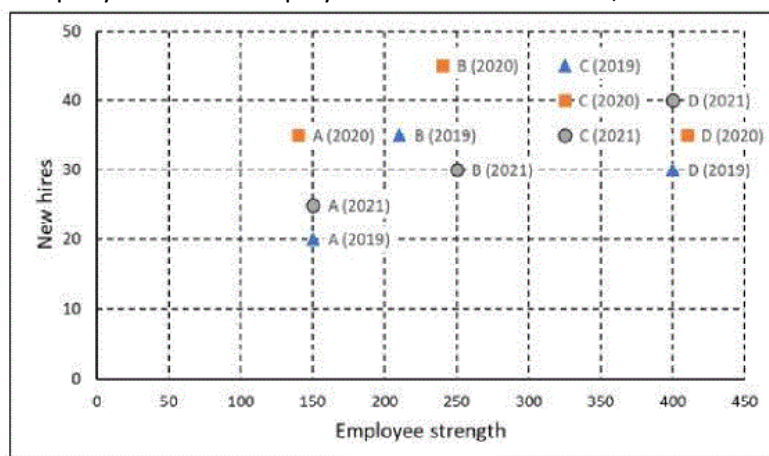
1. There were equal numbers of domestic and foreign products.
2. Half of the domestic products were FDA approved cosmetic products.
3. None of the foreign products had both the approvals, while 60 domestic products had both the approvals.
4. There were 140 nutrition products, half of them were foreign products.
5. There were 200 FDA approved products. 70 of them were foreign products and 120 of them were cosmetic products.
6. How many foreign products were FDA approved cosmetic products? \_\_\_\_\_
7. How many cosmetic products did not have FDA approval? \_\_\_\_\_
8. Which among the following options best represents the number of domestic cosmetic products that had both the approvals?
  - 1) At least 20 and at most 50
  - 2) At least 10 and at most 80
  - 3) At least 20 and at most 70
  - 4) At least 10 and at most 60
9. If 70 cosmetic products did not have EU approval, then how many nutrition products had both the approvals?
  - 1) 20
  - 2) 30
  - 3) 50
  - 4) 10
10. If 50 nutrition products did not have EU approval, then how many domestic cosmetic products did not have EU approval? \_\_\_\_\_

# CAT 2024 Expected Paper

The two plots below show data for four companies code-named A, B, C, and D over three years - 2019, 2020, and 2021. The first plot shows the revenues and costs incurred by the companies during these years. For example, in 2021, company C earned Rs.100 crores in revenue and spent Rs.30 crores. The profit of a company is defined as its revenue minus its costs.



The second plot shows the number of employees employed by the company (employee strength) at the start of each of these three years, as well as the number of new employees hired each year (new hires). For example, Company B had 250 employees at the start of 2021, and 30 new employees joined the company during the year.



- Considering all three years, which company had the highest annual profit?  
1) Company A 2) Company B 3) Company C 4) Company D
- Which of the four companies experienced the highest annual loss in any of the years?  
1) Company A 2) Company C 3) Company B 4) Company D
- The ratio of a company's annual profit to its annual costs is a measure of its performance. Which of the four companies had the lowest value of this ratio in 2019?  
1) Company D 2) Company C 3) Company B 4) Company A
- The total number of employees lost in 2019 and 2020 was the least for:  
1) Company D 2) Company A 3) Company C 4) Company B
- Profit per employee is the ratio of a company's profit to its employee strength. For this purpose, the employee strength in a year is the average of the employee strength at the beginning of that year and the beginning of the next year. In 2020, which of the four companies had the highest profit per employee?  
1) Company D 2) Company B 3) Company A 4) Company C

# CAT 2024 Expected Paper

Amudha, Bharatan, Chandran, Dhinesh, Ezhil, Fani and Gowtham are seven people in a town. Any pair of them could either be strangers, acquaintances, or friends. All relationships are mutual. For example, if Amudha is a friend of Bharatan, then Bharatan is also a friend of Amudha. Similarly, if Amudha is a stranger to Bharatan, then Bharatan is also a stranger to Amudha.

Partial information about the number of friends, acquaintances, and strangers of each of these people among them is given in the table below.

	No. of Friends	No. of Acquaintances	No. of Strangers
Amudha		1	4
Bharatan			
Chandran		1	
Dhinesh			2
Ezhil			1
Fani	1		
Gowtham		3	2

The following additional facts are also known.

1. Amudha, Bharatan, and Chandran are mutual strangers.
2. Amudha, Dhinesh, and Fani are Ezhil's friends.
3. Chandran and Gowtham are friends.
4. Every friend of Amudha is an acquaintance of Bharatan, and every acquaintance of Bharatan is a friend of Amudha.
5. Every friend of Bharatan is an acquaintance of Amudha, and every acquaintance of Amudha is a friend of Bharatan.

16. Who are Gowtham's acquaintances?

- 1) Dhinesh, Ezhil and Fani
- 2) Amudha, Dhinesh and Fani
- 3) Amudha, Bharatan and Fani
- 4) Bharatan, Dhinesh and Ezhil

17. Which of these pairs share the same type of relationship?

- 1) (Chandran, Ezhil) and (Dhinesh, Gowtham)
- 2) (Bharatan, Chandran) and (Dhinesh, Ezhil)
- 3) (Bharatan, Ezhil) and (Fani, Gowtham)
- 4) (Amudha, Gowtham) and (Ezhil, Fani)

18. Who is an acquaintance of Amudha? 1) Ezhil 2) Gowtham 3) Dhinesh 4) Fani

19. Who is an acquaintance of Chandran? 1) Bharatan 2) Dhinesh 3) Ezhil 4) Fani

20. How many friends does Ezhil have? \_\_\_\_\_ TITA

Solutions 1 - 5

- 1.2
- 2.2
- 3.2
- 4.2
- 5.4

Step 1: Analyzing Voting and Department Conditions

1. Understanding Candidate P's Votes:
  - Candidate P received 3 votes.
  - Candidate S voted for P, giving 2 votes from their department (suggesting S's department could be either B & H or another department where P isn't from).
2. Determining Departments of Candidates:
  - P cannot be from the same department as S.
  - Since there's only 1 candidate from B & H, and S has already given votes to P, it implies P cannot be from B & H.
  - So, P could belong to the department M & S (Marketing & Sales).
3. Votes Distribution for Q and Other Candidates:
  - Q received 14 votes: 9 from F & A (Finance & Accounting) and 4 from O & Q (Operations & Quality). This means Q isn't from F & A or O & Q.
  - Q could be from M & S.
4. Excluding Departments for R and S:
  - Since S voted for P, they can't be in the same department.
  - R voted for Q, so R and Q can't be in the same department.
  - As each department has only one candidate, R can't be from M & S (Q's department).
  - Thus, R can be from F & A, and S from O & Q or B & H.
5. Conclusion from Step 1:
  - P and Q belong to M & S.
  - Q and S could belong to either B & H or O & Q in any order.

Step 2: Organizing Information in Tables

Table 1: Votes by Candidate and Members

This table shows how many votes each candidate received and from which members:

- P received 3 votes (2 from S in department B & H).
- Q received 14 votes (13 from R in F & A and some from O & Q).
- R received 6 votes (2 from department F & A and 5 from M & S).
- S received 1 vote (from Q in O & Q).

Table 2: Departments and Candidate Allocation

This table summarizes the total number of faculties in each department, how many members voted, and which candidate is from each department:

- F & A: Total faculties = 9, with 9 members who voted. Candidate = R.
- M & S: Total faculties = 7, with 5 members who voted. Candidates = P and Q.
- O & Q and B & H: Assigned candidates are S and another candidate from M & S or B & H, respectively, each with specific voting configurations.

This puzzle involves logic deductions and constraints about departmental affiliations and voting patterns to determine candidates' departments and voting dynamics.

Candidate Votes and Departments - Table 1

Candidate	Votes Received	Votes By	Department
P	3	S	B & H (2)
Q	14	R	M & S (5)
R	6	F & A (9) + O & Q (4)	F & A (9)
S	1	Q	O & Q

Department and Faculty Distribution - Table 2

Department	Total Faculties	Members Voted	Candidates
------------	-----------------	---------------	------------

# CAT 2024 Expected Paper

F & A	9	9	R
M & S	7	5	P, Q
O & Q	5	4	S
B & H	3	2	B & H Candidate

Solution 6 - 10

6.40

7.1

8.4

9.4

10. 50

There are 320 products divided into two main categories: Cosmetic and Nutrition.

- Cosmetic products: 180
- Nutrition products: 140

Each category of products can be classified as either Foreign or Domestic, with each type potentially approved by FDA, EU, or both FDA & EU.

Breakdown of Information and Statements

1. Foreign and Domestic Distribution:

○ For Cosmetics (180 products):

- 90 are Foreign.
- 90 are Domestic.

○ For Nutrition (140 products):

- 70 are Foreign.
- 70 are Domestic.

2. Additional Information and Constraints:

- Statement (4) specifies that half of the Nutrition products are Foreign (70), leaving the other half as Domestic.
- The Cosmetic products are also split equally between Foreign and Domestic, making 90 each.

3. Equations and Statements Used for Calculation:

○ Statement (3):

▪ The sum of products approved by both FDA and EU for each category (denoted by variables xxx and yyy) must equal 60.

- $x+y=60$   
 $x + y = 60$

○ Statement (5):

▪ The total number of FDA-approved and EU-approved products, including all intersections, must sum up to 200.

- $p+q+x+s+b+y=200$   
 $p + q + x + s + b + y = 200$

○ Statement (2):

▪ Half of the Domestic products (both Cosmetic and Nutrition) are FDA-approved.

- $a+x=80$   
 $a + x = 80$

4. Solving the Variables:

○ Using the given statements and equations, we substitute values to solve for each variable.

○ By solving, we find:

- $a=40$ ,  $b=50$ ,  $p=40$ ,  $q=50$ ,  $s=30$ ,  $t=10$ ,  $u=20$

○ Thus, the values for each category are determined.

5. Final Table of Results:

The table summarizes the final values for each cell:

	Cosmetic (180)	Nutrition (140)
FDA	40 (Foreign), 40 (Domestic)	30 (Foreign), b (Domestic)
EU	50 (Foreign), 10 (Domestic)	20 (Foreign), 20 (Domestic)
FDA & EU	0 (Foreign), x (Domestic)	0 (Foreign), y (Domestic)

# CAT 2024 Expected Paper

This structured approach of using given equations to solve for each unknown helps fill in the table accurately, ultimately leading to a full understanding of the distribution of FDA and EU approvals among the Cosmetic and Nutrition products.

Solution 11 – 15

Solution

- 11. 3
- 12. 4
- 13. 4
- 14. 4
- 15. 2

Detailed solution

Here's the data presented in a table format for clarity:

Year	Company	Cost	Revenue	Employee Count	New Hires
2019	A	85	90	150	20
2019	B	75	100	210	35
2019	C	20	25	325	45
2019	D	40	50	400	30
2020	A	65	90	140	35
2020	B	40	90	240	45
2020	C	60	70	325	40
2020	D	50	50	410	35
2021	A	30	60	150	25
2021	B	30	90	250	30
2021	C	40	100	325	35
2021	D	70	70	400	40

And here's the Profit per Employee Ratio for each company in 2020:

Company	Profit	Employee Strength (Average of 2019 and 2020)	Ratio (Profit / Employee Strength)
A	25	145	25 / 145
B	50	245	50 / 245
C	10	325	10 / 325
D	-	-	Not Applicable

The largest ratio is for Company B.

1. Columns and Rows:

- The years are organized across columns, with each column containing data for Cost, Revenue, Employee count, and New hires.

- Each row represents data for a different company (A, B, C, or D).

2. Values:

- For each year, the table lists:

- Cost: The operating or production costs of the company.
- Revenue (Rev): The total income generated by the company.
- Employee count (Emp): The total number of employees.
- New hires (New): The number of new employees hired in that year.

3. Purpose:

- The table helps calculate profit per employee for each company in 2020. Profit per employee is derived by calculating the profit (Revenue - Cost) and dividing it by the average employee strength for that year.

Calculations for 2020

Below the table, there's a section that calculates the profit per employee for each company (A, B, and C) in 2020.

Here's how the calculation is performed:

1. Profit Calculation:
  - Profit = Revenue - Cost
2. Average Employee Strength:
  - For employee strength in 2020, the average of the 2019 and 2020 employee counts is used.
3. Profit per Employee Ratio:
  - The ratio is calculated as (Profit) / (Average Employee Strength).

Example of Calculations

For Company A in 2020:

- Profit = Revenue (90) - Cost (65) = 25
- Average Employee Strength = (2019 Employee + 2020 Employee) / 2 = (150 + 140) / 2 = 145
- Ratio = Profit / Employee Strength = 25 / 145

Similarly, calculations are done for companies B and C. Company D is excluded from the 2020 profit calculation because it has no profit (Revenue = Cost).

Conclusion

After comparing ratios, the highest ratio is observed for Company B in 2020, indicating that Company B has the largest profit per employee among the companies listed.

Solution 16 – 20

	Friends		Acquaintances		Strangers	
Amudha	E		D	1	B C F G	4
Bharatan	D		E		A C F G	
Chandran	G		F	1	A B C E	
Dhinesh	B E		A G		C F	2
Ezhil	A D F		B G		C	1
Fani	E	1	C G		A B D	
Gowtham	C		D E F	3	A B	2

Answers:

16. Dhinesh, Ezhil and Fani
17. (Bharatan, Ezhil) and (Fani, Gowtham)
18. Dhinesh
19. Fani
20. Ezil friends 3

## Quant Section

1. The cost of fencing a rectangular plot is ₹ 200 per ft along one side, and ₹ 100 per ft along the three other sides. If the area of the rectangular plot is 60000 sq. ft, then the lowest possible cost of fencing all four sides, in INR, is

- 1) 120000
- 2) 100000
- 3) 160000
- 4) 90000

For a real number  $a$ , if  $\frac{\log_{15}a + \log_{32}a}{(\log_{15}a)(\log_{32}a)} = 4$  then  $a$  must lie in the range

2.
  - 1)  $a > 5$
  - 2)  $3 < a < 4$
  - 3)  $2 < a < 3$
  - 4)  $4 < a < 5$

3. If  $f(x) = x^2 - 7x$  and  $g(x) = x + 3$ , then the minimum value of  $f(g(x)) - 3x$  is

3.
  - 1) -15
  - 2) -20
  - 3) -16
  - 4) -12

4. One day, Rahul started a work at 9 AM and Gautam joined him two hours later. They then worked together and completed the work at 5 PM the same day. If both had started at 9 AM and worked together, the work would have been completed 30 minutes earlier. Working alone, the time Rahul would have taken, in hours, to complete the work is

4.
  - 1) 10
  - 2) 12
  - 3) 11.5
  - 4) 12.5

Consider a sequence of real numbers  $x_1, x_2, x_3, \dots$  such that  $x_{n+1} = x_n + n - 1$

for all  $n \geq 1$ . If  $x_1 = -1$ , then  $x_{100}$  is equal to?

5.
  - 1) 4949
  - 2) 4850
  - 3) 4849
  - 4) 4950

6. Let  $f(x)$  be a quadratic polynomial in  $x$  such that  $f(x) \geq 0$  for all real numbers  $x$ . If  $f(2) = 0$  and  $f(4) = 6$ , then  $f(-2)$  is equal to

If  $3x + 2|y| + y = 7$  and  $x + |x| + 3y = 1$ , then  $x + 2y$  is

7.
  - 1) -4/3
  - 2) 1
  - 3) 0
  - 4) 8/3

8. Find the number of distinct pairs of integers  $(m,n)$  that satisfy the inequality:  $|1+mn| < |m+n| < 5$  \_\_\_\_\_ TITA.

9. There are two containers of the same volume, first container half-filled with sugar syrup and the second container half-filled with milk. Half the content of the first container is transferred to the second container, and then the half of this mixture is transferred back to the first container. Next, half the content of the first container is transferred back to the second container. Then the ratio of sugar syrup and milk in the second container is
- 1) 4 : 5
  - 2) 5 : 6
  - 3) 6 : 5
  - 4) 5 : 4
10. Two ships meet mid-ocean, and then, one ship goes south and the other ship goes west, both travelling at constant speeds. Two hours later, they are 60 km apart. If the speed of one of the ships is 6 km per hour more than the other one, then the speed, in km per hour, of the slower ship is
- 1) 20
  - 2) 18
  - 3) 24
  - 4) 12
11. If a and b are non-negative real numbers such that  $a + 2b = 6$ , then the average of the maximum and minimum possible values of  $(a + b)$  is
- 1) 3
  - 2) 4.5
  - 3) 4
  - 4) 3.5
12. Regular polygons A and B have number of sides in the ratio 1 : 2 and interior angles in the ratio 3 : 4. Then the number of sides of B equals \_\_\_\_\_
13. In an election, there were four candidates and 80% of the registered voters casted their votes. One of the candidates received 30% of the casted votes while the other three candidates received the remaining casted votes in the proportion 1 : 2 : 3. If the winner of the election received 2512 votes more than the candidate with the second highest votes, then the number of registered voters was \_\_\_\_\_
14. In triangle ABC, altitudes AD and BE are drawn to the corresponding bases. If  $\angle BAC = 45^\circ$  and  $\angle ABC = \theta$ , then AD/BE equals
- 1) 1
  - 2)  $\frac{(\sin \theta + \cos \theta)}{\sqrt{2}}$
  - 3)  $\sqrt{2} \cos \theta$
  - 4)  $\sqrt{2} \sin \theta$
15. Trains A and B start traveling at the same time towards each other with constant speeds from stations X and Y, respectively. Train A reaches station Y in 10 minutes while train B takes 9 minutes to reach station X after meeting train A. Then the total time taken, in minutes, by train B to travel from station Y to station X is
- 1) 12
  - 2) 10
  - 3) 15
  - 4) 6
16. All the vertices of a rectangle lie on a circle of radius R. If the perimeter of the rectangle is P, then the area of the rectangle is
- 1)  $\frac{P^2}{16} - R^2$
  - 2)  $\frac{P^2}{2} - 2PR$

3)  $\frac{P^2}{8} - \frac{R^2}{2}$   
 4)  $\frac{P^2}{8} - 2R^2$

17. A trapezium ABCD has side AD parallel to BC,  $\angle BAD = 90^\circ$ , BC = 3 cm and AD = 8 cm. If the perimeter of this trapezium is 36 cm, then its area, in sq. cm, is \_\_\_\_\_

18. AB is a diameter of a circle of radius 5 cm. Let P and Q be two points on the circle so that the length of PB is 6 cm, and the length of AP is twice that of AQ. Then the length, in cm, of QB is nearest to

- 1) 9.1
- 2) 9.3
- 3) 7.8
- 4) 8.5

19. The product of the distinct roots of  $|x^2 - x - 6| = x + 2$  is

- 1) -24
- 2) -16
- 3) -8
- 4) -4

20. The wheels of bicycles A and B have radii 30 cm and 40 cm, respectively. While traveling a certain distance, each wheel of A required 5000 more revolutions than each wheel of B. If bicycle B traveled this distance in 45 minutes, then its speed, in km per hour, was

- 1)  $18\pi$
- 2)  $12\pi$
- 3)  $16\pi$
- 4)  $14\pi$

If  $a_1, a_2, \dots$  are in A.P., then

$$\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_n} + \sqrt{a_{n+1}}}$$

21. is equal to  $\frac{\quad}{n-1}$

- 1)  $\frac{\sqrt{a_1} + \sqrt{a_{n-1}}}{n-1}$
- 2)  $\frac{\sqrt{a_1} + \sqrt{a_n}}{n}$
- 3)  $\frac{\sqrt{a_1} + \sqrt{a_{n+1}}}{n}$
- 4)  $\frac{\sqrt{a_1} - \sqrt{a_{n+1}}}{n}$

Any non-zero real numbers  $x, y$  such that  $y \neq 3$  and

$\frac{x}{y} < \frac{x+3}{y-3}$ , will satisfy the condition

- 22.
- 1) If  $y > 10$ , then  $-x > y$
  - 2) If  $x < 0$ , then  $-x < y$
  - 3) If  $y < 0$ , then  $-x < y$
  - 4)  $\frac{x}{y} < \frac{y}{x}$

1. G Strategy break up: Option A.
1. **Given:** Let the length and breadth of the rectangle be  $a$  and  $b$ .
2. **Area Constraint:**  $a \times b = 60000$ .
3. **Cost Function:** The cost is given by  $200 \times a + 100 \times (2b + a) = 100 \times [3a + 2b]$ .
4. **Objective:** Minimize the cost.
5. **Using AM-GM Inequality:**
  - $AM \geq GM \Rightarrow \frac{(a+b)}{2} \geq \sqrt{ab}$ .
  - Here,  $\frac{(3a+2b)}{2} \geq \sqrt{(60000 \times 6)}$ .
6. **Minimization Condition:** The minimum occurs when  $3a = 2b = 600$ .
7. **Lowest Cost Calculation:**  $100 \times (600 + 600) = \text{Rs. } 1,20,000$ .

This solution uses the Arithmetic Mean-Geometric Mean (AM-GM) inequality to achieve the minimum cost. The answer for the lowest cost is **Rs. 1,20,000**.

2. No Shortcut. Option 4.
1. **Given Expression:**

$$\frac{\log_{15} a + \log_{32} a}{\log_{15} a \cdot \log_{32} a} = 4$$

2. **Rewrite Using Reciprocal of Logs:**

$$\frac{1}{\log_{32} a} + \frac{1}{\log_{15} a} = 4$$

3. **Convert to a Single Logarithmic Equation:**

$$\log_a(32 \times 15) = 4$$

4. **Simplify the Expression:**

- Since  $\log_a(32 \times 15) = 4$ , we have:

$$a^4 = 32 \times 15 = 480$$

5. **Determine the Range of  $a$ :**

- Since  $4^4 = 256$  and  $5^4 = 625$ , we see that 480 lies between these values.
- Thus,  $4 < a < 5$ .

**Conclusion:** The value of  $a$  lies between 4 and 5, so the solution is:

$$4 < a < 5$$

3. G Strategy: Vedic Tables. Option 3.

1. Calculate  $f(g(x))$ :

- Substitute  $g(x) = x + 3$  into  $f(x)$ :

$$f(g(x)) = f(x + 3) = (x + 3)^2 - 7(x + 3)$$

2. Expand  $f(g(x))$ :

$$f(g(x)) = (x^2 + 6x + 9) - 7x - 21$$

$$f(g(x)) = x^2 - x - 12$$

3. Formulate the Expression  $f(g(x)) - 3x$ :

$$f(g(x)) - 3x = (x^2 - x - 12) - 3x$$

$$f(g(x)) - 3x = x^2 - 4x - 12$$

Put  $x = 1 \Rightarrow f(g(x)) - 3x = -15$

Put  $x = 2 \Rightarrow f(g(x)) - 3x = -16$

Put  $x = 3 \Rightarrow f(g(x)) - 3x = -15$

Therefore answer is  $-16$ .

4. No Shortcut. Answer 1

1. Given Data:

- Rahul worked for 8 hours.
- Gautam worked for 6 hours.
- Let the units of work done per hour by Rahul and Gautam be  $r$  and  $g$ , respectively.

2. Formulate Equations:

- According to the question:

$$W = 8r + 6g \quad (\text{Equation i})$$

- It is also given that:

$$W = 7.5(r + g) \quad (\text{Equation ii})$$

3. Setting up the Ratio:

- Equating the two expressions for  $W$ :

$$8r + 6g = 7.5(r + g)$$

- Expanding and simplifying:

$$8r + 6g = 7.5r + 7.5g$$

$$0.5r = 1.5g$$

$$r : g = 1 : 3 \quad \Rightarrow \quad 2r = 6g$$

4. Substitute in Equation (i):

- Substitute  $6g = 2r$  into (i):

$$W = 10r$$

5. Finding  $\frac{W}{r}$ :

- Therefore,  $\frac{W}{r} = 10$  hours.

5. G Strategy Tables Answer 2

1. Given Recurrence Relation:

$$x_{n+1} = x_n + n - 1$$

2. Calculate the First Few Terms to Identify a Pattern:

- $x_1 = -1$
- $x_2 = x_1 + (1 - 1) = -1 + 0 = -1$
- $x_3 = x_2 + (2 - 1) = -1 + 1 = 0$
- $x_4 = x_3 + (3 - 1) = 0 + 2 = 2$
- $x_5 = x_4 + (4 - 1) = 2 + 3 = 5$

It appears that the sequence may grow linearly or with an identifiable pattern.

3. **Recursive Pattern and Formula Development:** The recurrence relation suggests that each term  $x_{n+1}$  depends on the previous term with an increment that grows as  $n - 1$ . To determine  $x_{100}$ , we would sum up these increments over the range of terms.

calculate  $x_{100}$  based on this recurrence relation.

The value of  $x_{100}$  in the sequence is 4850.

6. G Strategy X maro. Answer 24.

Given:  $f(x) \geq 0$  for all real numbers  $x$  which implies discriminant  $D \leq 0$ .

Since  $f(2) = 0$ , therefore,  $x = 2$  is a root of  $f(x)$ .

Note that the discriminant  $D \leq 0$  and 2 is a root of  $f(x)$ .

So,  $D = 0$

Therefore,  $f(x) = a(x - 2)^2$

$$\Rightarrow f(4) = 6$$

$$\Rightarrow 6 = a(4 - 2)^2$$

$$\Rightarrow a = \frac{3}{2}$$

$$\therefore f(-2) = \frac{3}{2}(-4)^2 = 24.$$

7. Tables G Strategy: Answer 3

Given  $3x + 2|y| + y = 7$  and  $x + |x| + 3y = 1$

If $x > 0, y > 0$	$3x + 2y + y = 7$ $x + x + 3y = 1$	We get $x = 6$ and $y = -ve$ This is a contradiction as $y < 0$ .
If $x > 0, y < 0$	$3x - 2y + y = 7$ $x + x + 3y = 1$	We get $x = 2$ and $y = -1$ . This is a possible solution
If $x < 0, y > 0$	$3x + 2y + y = 7$ $x - x + 3y = 1$	We get $x = 2$ and $y = 1/3$ This is a contradiction as $x > 0$ .
If $x < 0, y < 0$	$-3x - 2y + y = 7$ $x - x + 3y = 1$	We get $y = 1/3$ and $x = -ve$ This is a contradiction as $y > 0$ .

So  $x + 2y = 2 - 2 = 0$  for  $(x, y) = (2, -1)$ .

8. No Shortcut, Answer 12.

1. Understand the Inequality:

- The inequality has two parts:

$$|1 + mn| < |m + n| \quad \text{and} \quad |m + n| < 5$$

2. Identify Possible Values for  $|m + n|$ :

- Since  $|m + n|$  must be less than 5, possible values for  $|m + n|$  are 0, 1, 2, 3, or 4.
- For each case, we need to check if there exist integer pairs  $(m, n)$  such that both parts of the inequality hold.

3. Testing Integer Pairs:

- We need to consider combinations of positive and negative values of  $m$  and  $n$  to see if they satisfy both inequalities.

I'll calculate the possible pairs  $(m, n)$  that satisfy the conditions.

The number of distinct pairs of integers  $(m, n)$  that satisfy the inequality  $|1 + mn| < |m + n| < 5$  is 12.

The valid pairs are:

$\{(-4, 0), (-3, 0), (-2, 0), (0, -4), (0, -3), (0, -2), (0, 2), (0, 3), (0, 4), (2, 0), (3, 0), (4, 0)\}$

9. Answer 2, G Strategy: Breakup | Equations, Mixtures

## 1. Initial Setup:

- Total volume of each container is 200 units.
- Container *A* initially has 100 units of sugar syrup (SS).
- Container *B* initially has 100 units of milk.

## 2. Step-by-Step Mixing Process:

- **Step 1:** Transfer 50 units from *A* to *B*:
  - Container *A*: 50 units of SS remain.
  - Container *B*: 100 units of milk and 50 units of SS.
- **Step 2:** Transfer 50 units from *B* back to *A*:
  - Container *A*: 75 units of SS and 50 units of milk.
  - Container *B*: 50 units of milk and 25 units of SS.
- **Step 3:** Transfer 25 units from *A* to *B*:
  - Container *A*: 37.5 units of SS and 25 units of milk.
  - Container *B*: 75 units of milk and 62.5 units of SS.

## 3. Final Ratio Calculation:

- The final quantities of SS and milk in container *B* are 62.5 and 75, respectively.
- The required ratio of SS to milk in container *B* is:

$$62.5 : 75 = 5 : 6$$

## 10. Answer 2. Breakup Strategy. TSD & Trigonometry basics

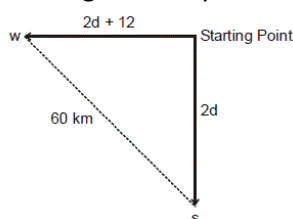
1. Let the speed of the two ships be:

- $s$  km/hr for the slower ship.
- $s + 6$  km/hr for the faster ship.

2. In 2 hours, the distances traveled by the ships will be:

- Slower ship:  $2s$  km.
- Faster ship:  $2(s + 6) = 2s + 12$  km.

3. The ships travel in such a way that they form a right triangle, with the two distances as the legs of the triangle and the distance between them as the hypotenuse, which is given as 60 km.



### Applying the Pythagorean Theorem

Using the Pythagorean theorem:

$$(2s)^2 + (2s + 12)^2 = 60^2$$

Step 1: Expand the Equation

1.  $(2s)^2 = 4s^2$
2.  $(2s + 12)^2 = 4s^2 + 48s + 144$
3.  $60^2 = 3600$

Substituting these into the equation:

$$4s^2 + (4s^2 + 48s + 144) = 3600$$

Step 2: Simplify the Equation

Combine like terms:

$$8s^2 + 48s + 144 = 3600$$

## 11. Solving Quadratic equation. $S = 18$

### Answer 2; Vedic Table Strategy

Given  $a + 2b = 6$

Possible non-negative values of  $a, b$  are:-

a	b	a + b
0	3	3
2	2	4
4	1	5
6	0	6

∴ Maximum possible value of  $a + b = 6$

and, minimum possible value of  $a + b = 3$

Required average =  $\frac{6+3}{2} = 4.5$ .

## 12. G Strategy: Breakup | Angles, Polygon

### 1. Interior Angle Formula:

- For a polygon with  $n$  sides, the sum of interior angles is  $(n - 2) \times 180$  degrees.
- The measure of each interior angle for polygon  $A$  is:

$$\frac{(n - 2) \times 180}{n}$$

- Similarly, for polygon  $B$  with  $2n$  sides, the measure of each interior angle is:

$$\frac{(2n - 2) \times 180}{2n}$$

### 2. Given Condition:

- According to the problem, the ratio of the interior angle of polygon  $A$  to that of polygon  $B$  is  $\frac{3}{4}$ :

$$\frac{\frac{(n-2) \times 180}{n}}{\frac{(2n-2) \times 180}{2n}} = \frac{3}{4}$$

### 3. Simplify the Equation:

- Cancel 180 from both the numerator and denominator:

$$\frac{n - 2}{n} \div \frac{2n - 2}{2n} = \frac{3}{4}$$

- Rewrite as:

$$\frac{n - 2}{n - 1} = \frac{3}{4}$$

### 4. Cross-Multiply to Solve for $n$ :

$$4(n - 2) = 3(n - 1)$$

$$4n - 8 = 3n - 3$$

$$n = 5$$

### 5. Calculate the Number of Sides of Polygon $B$ :

- Since  $B$  has  $2n$  sides, substitute  $n = 5$ :

$$2 \times 5 = 10$$

## 13. G Strategy: Percentages, Ratios

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- Let the total number of registered votes be  $100x$ .
- The number of votes cast is 80% of the registered votes, which is  $80x$ .

Votes Received by One Candidate:

- One candidate received 30% of the votes cast:

$$\frac{30}{100} \times 80x = 24x$$

Remaining Votes:

- The remaining votes after the first candidate are:

$$80x - 24x = 56x$$

Distribution of Remaining Votes Among the Other Three Candidates:

- The remaining 56x votes are distributed among three other candidates in the ratio 1 : 2 : 3.

Votes for each candidate:

- First candidate:  $\frac{1}{6} \times 56x = \frac{56x}{6}$
- Second candidate:  $\frac{2}{6} \times 56x = \frac{2 \times 56x}{6} = \frac{112x}{6}$
- Third candidate:  $\frac{3}{6} \times 56x = \frac{3 \times 56x}{6} = \frac{168x}{6}$

Given Condition:

- We are given:

$$28x - 24x = 2512$$

- Simplify to find  $x$ :

$$4x = 2512 \Rightarrow x = \frac{2512}{4} = 628$$

Calculate the Total Registered Votes:

- Since the total registered votes are  $100x$ :

$$100 \times 628 = 62800$$

14. G Strategy: Visual POE.  $\sqrt{2} \sin \theta$  is most common answer using options.

15. No Shortcut

LCM of 9 and 10 as distance between X and Y

$D = 90$

Speed of A is  $90/10 \Rightarrow A = 9$

Let time it will take for them to meet be  $t$

$t = 9B/A \Rightarrow t = B$

Therefore  $9B/A = 90/A + B$

$B = 90/9 + B$

$B^2 + 9B - 90 = 0$

$(B - 6)(B + 15) = 0$

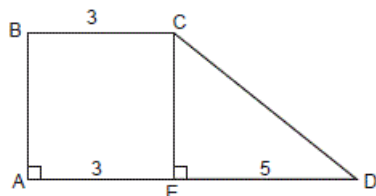
$B = 6$

So time it will take train B to travel from Y to X

$9B/A + 9 = 15$

16. G Strategy: Visual POE.  $\frac{P^2}{8} - 2R^2$  is most common option.

17. G Strategy: Breakup Triplets



Recognizing the triplet 5, 12, 13, we conclude:  $CD = 13$  cm

Calculate the Area of the Trapezium  $ABCD$ :

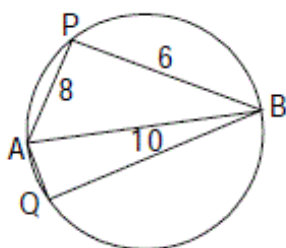
- The height of the trapezium (distance between parallel sides  $AB$  and  $CD$ ) is  $AE = 12$  cm.
- The lengths of the parallel sides are  $AB = 3$  cm and  $CD = 13$  cm.
- Area of a trapezium formula:

$$\text{Area} = \frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$$

- Substitute the values:

$$\begin{aligned} \text{Area} &= \frac{1}{2} \times (3 + 13) \times 12 \\ &= \frac{1}{2} \times 16 \times 12 \\ &= 8 \times 12 = 96 \text{ cm}^2 \end{aligned}$$

## 18. G Strategy: Breakup AP GP, Triangles, Circles



1. Given Information:

- $AB = 10$  (the hypotenuse of the right triangle  $\triangle APB$ ).
- $AP = 6$ .

2. Calculate  $AP$ : Since  $\triangle APB$  is a right triangle, we use the Pythagorean theorem:

$$AP = \sqrt{AB^2 - PB^2} = \sqrt{10^2 - 6^2} = \sqrt{100 - 36} = \sqrt{64} = 8$$

3. Given  $AQ$ :

- $AQ$  is given as 4.

4. Calculate  $QB$ : Using the Pythagorean theorem on  $\triangle AQB$ :

$$QB = \sqrt{AB^2 - AQ^2} = \sqrt{10^2 - 4^2} = \sqrt{100 - 16} = \sqrt{84} \approx 9.1$$

**Conclusion:**

The lengths are as follows:

- $AP = 8$
- $AQ = 4$
- $QB \approx 9.1$

## 19. No Shortcut

Given :-  $|x^2 - x - 6| = x + 2$

$\Rightarrow |(x - 3)(x + 2)| = x + 2$

For  $x < -2$ ,  $(3 - x)(-x - 2) = x + 2$

$\Rightarrow x - 3 = 1 \Rightarrow x = 4$  (Not possible, as  $x < -2$ )

For  $-2 \leq x < 3$ ,  $(3 - x)(x + 2) = (x + 2)$

$\Rightarrow x = 2, -2$

For  $x \geq 3$ ,  $(x - 3)(x + 2) = x + 2$

$\Rightarrow x = 4$

Hence the product =  $4 \times 2 \times (-2) = -16$

## 20. G Strategy Breakup | Circle, TSD

### 1. Determine the Distance Traveled per Revolution for Each Bicycle:

- The circumference of a wheel is given by  $C = 2\pi r$ .
- For Bicycle A (radius 30 cm):
  - Circumference of A's wheel =  $2 \times \pi \times 30 = 60\pi$  cm
- For Bicycle B (radius 40 cm):
  - Circumference of B's wheel =  $2 \times \pi \times 40 = 80\pi$  cm

### 2. Let the Number of Revolutions of Bicycle B be $n$ :

- The distance traveled by Bicycle B is:
  - Distance =  $n \times 80\pi$  cm

### 3. Calculate the Distance for Bicycle A:

- Bicycle A requires 5000 more revolutions than Bicycle B, so the number of revolutions for A is  $n + 5000$ .
- The distance traveled by Bicycle A is:
  - Distance =  $(n + 5000) \times 60\pi$  cm

### 4. Equate the Distances Traveled by Both Bicycles: Since both bicycles traveled the same distance:

$$n \times 80\pi = (n + 5000) \times 60\pi$$

- Cancel  $\pi$  from both sides:

$$80n = 60n + 300000$$

- Simplify to solve for  $n$ :

$$20n = 300000$$

$$n = 15000$$

### 5. Calculate the Distance Traveled by Bicycle B:

- Using  $n = 15000$  revolutions for Bicycle B:
  - Distance =  $15000 \times 80\pi$  cm
  - Distance =  $1200000\pi$  cm

### 6. Convert the Distance to Kilometers:

- Convert cm to km:

$$1200000\pi \text{ cm} = 1200000 \times \frac{\pi}{100000} \text{ km}$$

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$\approx 37.68 \text{ km}$

7. Calculate the Speed of Bicycle B:

- Bicycle B took 45 minutes to travel this distance, which is  $\frac{45}{60} = 0.75$  hours.
- Speed = Distance / Time:

$$\text{Speed} = \frac{37.68}{0.75} \approx 50.24 \text{ km/hr}$$

21. G Strategy: Visual POE. Option 3 is most common answer using options.

22. G Strategy: option 3. X maro strategy. If  $y < 0$ , then  $-x < y$ ; put  $y = -1$ .